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Private equity, debt and financial distress. Is there evidence of excessive bankruptcies in Europe?

Master Thesis

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Statement of Originality

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Abstract

In this master thesis, private equity activities for the European market are examined, in terms of level of financial distress, as well as the bankruptcy rates that occurred. The data sample is divided into two categories of first time private equity backed companies, consisting of 4844 observations, and secondary buyouts, consisting of 1401 observations. The same rate of a deterioration of financial health had been found for both groups. Within private equity backed companies the secondary buyouts had been found to be less burdened in comparison with the first timers, regarding the acquisition event. The financial health worsens with each year of private equity involvement for the secondary buyouts, which is not the case for the first timers. However, the bigger sample of first time backed companies appear to default more often, whereas for the secondary buyouts there is no distinction in bankruptcy rate compared to the peer group of companies. Favourable credit condition is associated with lower bankruptcy rate, for both categories. It is evident that private equity firms impose extra burden, but within reasonable limits. The bankruptcy rate is higher for the bigger group of companies, but the magnitude is not large, further specifications showing a downward direction. Conclusion of the study is that private equity firms are run sensibly, and probably should not be burden with excessive regulation.

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Part I. Introduction

Private equity industry has grown substantially in the last two decades, exerting ever more influence in most developed economies. At the same time, a part of the business model these firms espouse, i.e. buying companies, restructuring, selling at a profit, often using loads of debt along the way, is highly controversial and hotly argued about in the public debate, as well as in the academic literature. According to Bain and Company, a consultancy, in 2013 private equity backed companies accounted for 23% of US mid-sized firms, and 11% of its large ones. On the other hand, according to Preqin, a research firm, the aggregate amount of money available to private equity managers for investments(the so called 'dry powder')in 2016 is estimated to be over $1.3 trillion, which is truly remarkable sum. These facts suggest that private equity firms affect the lives of ever more people. In the eyes of many citizens the industry conjures up rather negative connotations, as the candidacy of Mitt Romney for US President in 2012 could attest. Mr Romney, a partner at one of the biggest private equity firms, Bain Capital was heavily criticised for his role in the firm, and his tenure there, was considered as an impediment for the public office that he sought. Whether private equity firms contribute to the well-being of the economy or a undesirable 'locusts', is eagerly contested, and in my master thesis I would endeavour to investigate a narrow domain of the business of the private equity firms, namely whether they impose higher financial distress on the companies they acquire, as a result of the debt financing that they usually use. A second part of the analysis is to test whether private equity backed firms default more often than companies that had never experienced private equity involvement.

The research question is interesting since it is designed to test the hypothesis that the private equity firms use excessive leverage, which eventually results in higher bankruptcies, thereby leading to negative repercussions for the economy as a whole. It could also shed light on the merits of regulating the industry. The importance of the topic is also underpinned by the vast funds committed to private equity management. If private equity firms are prone to excess, as some argue, then probably policy makers could contemplate necessary restrictions. This is why my research question

is relevant and is good to test what is the relationship between those financial managers and the cases of defaults that could follow as a result of their actions. There could be individual high profile disasters, but the important point here is what is the average track record of a private equity firm.

My topic relates to the existing literature on financial distress that results from private equity involvement in a company. The main theory is that controlling for various factors private equity firms do not cause the entities that they manage to default in higher rates than the rest of the economy. My contribution to the literature is to divide the companies into two groups: 'first time private equity backed' and 'secondary buyouts'. The latter entails multiple involvements of a financial sponsor, and could be considered more saddled by obligations, and prone to more risks. Therefore, apart from looking at the financial distress as a whole I also try to distinguish the two types of acquisitions and draw conclusions for the private equity managers.

The financial distress is an important topic that have to be investigated, since there are a number of legitimate concerns about the industry. Morris(2010) criticizes the business of private equity, arguing that those companies, responsible for such a large chunk of the economy, actually provide very little information about their operations and about the portfolio of companies they manage. He argues towards some requirements for private equity firms to disclose more about their business and financing. Ljungqvist et al.(2016) focuses on a sub-segment of the market, i.e. public-to-private deals conducted by private equity, and argue that excessive delistings would lead to negative externalities for society, in the form of depriving citizens from owning a large part of assets, unlike the case of the venerable public company. These and other concerns justify the investigation of the distress private equity imposes on their targets. How big is it? Is there evidence of plausible internal constraints? What could be summarized for a large number of concluded deals?

In order to answer the research question, this master thesis delves into the European market for mergers and acquisitions, specifically selecting the transactions in which private equity firms are the acquirer. The data provider is Bureau Van Dijk, and it had been chosen, since it contains data on private companies after been acquired, information that is unavailable from other providers. Other papers in the field also use that database, as well as ThopsonOne, CapitalIQ or information on defaults from credit rating agencies like S&P or Moody's. Methodology consists of appropriate

selection of all deals, dividing the sample into first time backed from private equity and secondary buyouts. Care had been taken to find the 'best' peer group of companies for econometric comparison. Accounting data for all entities selected had been downloaded. Multivariate analysis had been performed, controlling for various characteristics of the companies acquired and respective conclusions drawn.

The thesis is structured as follows: review of the existing literature on the subject, description of the methodology involved as well as some econometric concerns, analysis of the data and some summary statistics. Next, the main results for the two groups of deals, as well as two parts of the investigation–financial distress and bankruptcy, is discussed. Alternative estimations and discussion about robustness of the results are in the penultimate part. Finally, conclusion and discussion of the major findings as well as implications for the regulators.

Part II. Literature review/background

Main theories and existing empirical evidence from prior research

Brief introduction

The phenomenon of 'private equity' first appeared in the early 1980s, and grew up substantially towards the second part of the decade, featuring a landmark deal of KKR acquiring RJR Nabisco. The term 'private equity' is essentially an euphemism capturing all types of activities in which a holding company raises funds to invest in portfolio companies often using a high level of debt. Ever since those holding companies collectively known as private equity(PE) emerged, there has been an intense debate in the financial economics literature, about the merits of such companies and whether they contribute to the health of the overall economy or hinder it. A large body of academic literature mostly finds positive impact of the operations of these private equity firms, whereas the public opinion and the media, predominantly criticise them, and are quick to point out mainly the negative developments in the area.

A major theory in the literature is that PEs are sophisticated organizations that restructure

companies, provide critical financing in different stages of entities, and overall–contributing to the well-being of the acquired firms. However that 'main theory' is far from crystal clear and intuitive, and therefore the debate is going on as to how actually those PEs are doing in terms of performance, financial distress, bankruptcies and so on. Different studies use different methodologies, data and come to results that vary in precision and final conclusion. Part of the reason for that diversity is the difficulty of collecting accurate information about companies that are acquired by PEs, after all they are not compelled to divulge information like their public brethren. In my opinion this is also why there is such a heated debate in the literature about the business of PEs–they increasingly control a large chunk of the economy, yet information is sparse and hard to collect. The best studies in the field actually are best, for the way they aggregate the data, as well as their methods. Nevertheless, the many papers written, and opinions manifested in articles, serve as a useful check on the industry, something that with the public company is done by the market. So the exhausted literature on the subject is welcome and desirable and we would expect scholars to continue to argue about the business of the PE.

Why private equity use debt?

Intuitively, a reason should exist, as to why the private equity firms put so much strain on the companies they acquire, and risk subsequent failure of the targets? One of the most important papers on PE, answering such question, is the seminal research of Jensen(1989). He argues, very persuasively, that the leveraged buyout(LBO) structure, which the PE use is a superior form of organization than the widely touted public company. However, the author stresses that this is true only for companies that lack high growth opportunities. In particular not all companies are appropriate to be bought by a PE in an LBO, but perhaps for those that are, the LBO is bringing benefits, and some costs. Particularly, for businesses with low growth opportunities and stable cash flows, the PE ownership is beneficial since it restrains management from wasting cash. Jensen(1989) argues that the public corporation is a good structure for high growth companies and gives the management of the company broad latitude for taking decisions in the name of achieving high performance. This composition however also yields the so called 'agency problem', namely that the executives would not always act in the interests of shareholders. The main argument here is that

for high growing companies the trade-off manifested by the agency problem is justifiable, whereas for companies with a more 'stale' business model, the restrictions that the debt obligations offer are actually positive. Of course LBOs could be beneficial, provided that the PE firms act prudently, not taking excessive risks(i.e. too much debt), and broadly limit their activities within reasonable bounds. Whether that is happening in practice is an area of research, and my question aims to investigate the financial distress of the companies under PE. The Jensen(1989) paper even lacks empirical results, it merely summarizes and underlines the positive aspects of LBOs, pointing out that it can be a solution to many problems that beset the public corporation.

The important point that my thesis is investigating, is to see whether the companies acquired by PEs default more often or are subject to higher distress, but the question remains: why do we need this debt in the first place? There is a good reason that this industry of PE firms has grown so rapidly in the last decade or two. Axelson et al.(2009) derives an analytical model that explains why private equity model exists as it is, and why these firms use leverage. There are differences between a 'normal' firm and a PE fund–the fund has a finite life and the resources are pooled ex ante. The financing for each deal depends on the already accumulated funds as well as on deal-by-deal bases. The compensation that the general partners(GP) receive depends on the performance of all the companies in the fund, and hence reduces the conflict of interests that each individual acquisition could bring. The main source of gains that PE firms accrue is due to the high leverage they use to complement the equity of the fund. The paper by Axelson et al.(2009) explains why this arrangement has the necessary checks and balances in order not to allow for excessive debt. There are restrictions on the amount of fund's capital that can be used in any one deal. Unlike in a normal firm in PE the resources raised are ear-marked to the specific project, and cross-financing is not allowed, giving extra incentives to act prudently. On the other hand, the fund has a finite life forcing the GPs to act and show good performance. The limits imposed on the GPs on investment in any one deal, gives them more leeway in actual investment decisions. That coupled with the reputation of the PE firm is a powerful constraint on the level of leverage to be used when acquiring companies. Even if at first glance, the PE business model looks controversial, it has the necessary constraints to be a plausible financial arrangement, according to the cited paper. Justification of the relatively frequent use of debt compared to equity according to the model is also in unison with

the pecking order theory in finance. In relation to my research question I would expect that the possibilities for financial distress are limited and that the companies acquired by PE are within suitable bounds, reflecting the incentives that the GPs have.

Determinants of debt in LBOs

An analysis on what drives the debt levels in LBOs is found in the paper Axelson, et al(2012). Specifically, the authors compare the determinants of leverage in the LBOed companies and other 'normal' public companies used as controls. Perhaps, surprisingly the data shows no relations between the two. According to the analysis of the paper, the factors that lead to the use of leverage in public companies are different than the factors that induce the PE firms to borrow. The authors posit that the credit conditions are the main driver behind the decisions of the PE. Conversely, in the broader economy, the companies' leverage vary according to cross-sectional and sector differences. A proxy for credit condition is used in the form of high-yield bond spread, and it can be seen that the PE firms pay higher prices when the credit is cheaper, and the reverse. That would also imply that the companies subject to a LBO deal are saddled with higher debts in good times, and that could have adverse consequences when the cost of debt increases, subsequently. The authors use fairly large sample(1157 buyouts) of private and public companies acquired by PE, which increases the credibility of their results. The paper finds negative relation between the debt availability, the pricing of the deals, and the subsequent performance of the PE funds. The authors find confirmation to the statement that PE firms use as much debt as they can, and possibly that in some cases leverage could be excessive and lead to more defaults and adverse influence to the economy as a whole. Axelson, et al(2012) is a very influential paper, cited by almost all other research on the topic, and also the high yield bond spread is used in this thesis as a part of the analysis of what could influence the financial distress.

Bankruptcy rates, financial distress and private equity. Empirical findings.

A paper that focuses on the financial distress and bankruptcy is Hotchkiss, et al(2014). The authors use loan database provided by Moody's (unlike other studies which select the deals done by PEs) to

analyse the probability of default of highly levered companies, dividing the sample into PE-backed and non-PE companies. That way they have a good control group for comparison and do not have to artificially construct one. To measure the probability of default authors use Cox proportional hazard model. The regressions show that the PE-backed companies, actually have higher probability of default, but controlling for leverage the difference is not significant, i.e. PE firms do not take excessive risks on average given the level of indebtedness they have. Recently exited companies have lower probability of default, which supports the idea of restructuring and improving the firms under PE. Using data from Moody's on default and recovery rates, the study investigates also how PE firms deal with financial distress. It is shown that the PE more often restructure out-of-court, which is cheaper and more efficient, implying that they indeed are experts in dealing with distress. Another paper looking at the same issues is Tykvová and Borell(2011). The authors focus on European data supplied by Bureau Van Dijk. They found that the risk of financial distress increases after LBO, but contrary to expectations the PE backed companies do not experience higher default rates. The study examines the effect of syndication of loans, and experience of PE firms, and found that the latter decreases the probability of default, while the former is an insignificant factor.

Another research dealing with the problems of insolvencies is Wright and Wilson(2013). The paper uses big dataset of UK private as well as public companies, however the authors study the relationship between management buyout(MBO) and management buy-in(MBI), private equity and financial distress. Arbitrarily the dataset is divided into two parts pre- and post- 2003, reflecting the dotcom period and a new Insolvency act in UK. Discreet-time hazard model is used in order to estimate the regression coefficients of interest. MBIs contain the highest insolvency risk, i.e. when the management acquiring the company is not the current one like in MBOs. Furthermore the PE backed deals appear to be riskier than the normal MBOs. The authors acknowledge that the effect of leverage in their model is difficult to disentangle, therefore they use a marginal effect of debt on insolvency rate(through first derivative). They found that the debt is not a significant factor in explaining the bankruptcies. A confirmation on a widely held view that the PE companies choose underperforming firms with better prospects is also evident by their results. Also a major finding is that controlling for performance and operational risk the PE backed deals do not exhibit higher bankruptcy rates, even if they have higher financial distress. The paper runs numerous regressions

on many different subsamples(e.g. post-2003 data show no worse results than the population as a whole), and the outcomes are broadly consistent and positive towards the PE industry. The Wright and Wilson(2013) paper is quite related to my own research question, investigating a detailed sample of companies for one country. The methods they use are somewhat different, but the broader logic is similar.

A related research is the paper Boucly, et al(2011). The authors study the French private equity market, comparing various financial indicators pre- and post-buyout, e.g. ROA, EBITDA Sales, Leverage and so on. The design and methodology of the paper are similar to my thesis, although instead they emphasise the performance and operational improvements, but also the effect of leverage is present in analysis of companies under PE. The hypothesis of the authors is that PE actually reduces credit constraints instead of imposing financial distress. They conjecture that in the relatively underdeveloped capital market in France, PE could play such a counter-intuitive role. The major finding in the study is that after an acquisition by PE the companies in question grow faster in therms of sales, EBITDA and other measures. That is mainly true for private-to-private, transactions, i.e. where the credit constraints are most likely to occur. The paper relies on constructing a control group based on very detailed characteristics and being able to identify one-to-one match of the PE and non-PE entities. The article exhibits different regressions, dividing the buyouts in separate categories in order to make a conclusion about what drives the hypothesised ease of the credit conditions, analysis similar to my approach. For example it is found that for the public-to-private deals that is not the case. Broadly, the findings of the Boucly, et al(2011), diverge by the main theory that the PE impose financial distress.

Opler and Titman(1993) investigated the relationship between financial distress and the probability of a firm to undergo a LBO. The authors found that companies with higher potential costs in the case of bankruptcy, i.e. direct as well as indirect, are less likely to be a target of a PE firm. Companies with lower Tobin's Q ratio, high cash flows, more diversified(i.e. without high growth prospects) are, according to their empirical findings more likely to be acquired by PE. Those results, corroborate the general discourse of the literature that PE tries to avoid excessive financial stress and bankruptcies, by carefully selecting their portfolios and prudently conducting their activities.

Additional related findings

An article that analyses one of the biggest samples of LBO transactions(21000) is Strömberg(2007). The author tries to shed light on the broader world of companies under PE ownership, after all Jensen(1989) predicted the eventual dominance of the LBO. One of the main conclusions of the study is that companies remain longer under PE ownership than is conventionally expected. The median length of an LBO is 8 years, 42% of the deals are exited within 5 years and only 2.9% of the investments are exited within 12 months. It suggests that the companies are staying longer under PE, and that the latter is somewhat more caring about the business, than just a quick flip would imply. The so called public-to-private transactions account for only 7%, while they represent around 28% of the total enterprise value. The author found that a total of 6% of all deals ended in bankruptcy, which amounts for 1.2% default rate per year. Higher than the firms on Compustat(0.6%), but lower than corporate bond defaults(1.6%). These findings have somewhat more credibility, given the large dataset and can be a good point to compare my results on the matter. Another important detail is that the paper uses imputed enterprise values for some missing values in the data in order for more complete analysis. Also somewhat surprisingly, no difference was found for bankruptcies over time, contrary to what would be expected. LBOs that are sponsored by financial firm, and use syndicated loans, have longer experience, are more likely to have a successful exit. A major conclusion of the article is that the public and private markets complement each other.

The tax benefits are another controversial aspect of the business model of the PE. Jenkinson et al.(2011) look in detail into the 100 biggest PE deals, with mostly hand collected data, and try to estimate the tax shields they collectively enjoy thanks to interest tax deductibility. Of course, the tax shield is connected with the level of debt and the attraction of higher debt should be balanced with the costs of financial distress. The authors then estimate the present value of the future tax savings and run different scenarios varying the underlying assumptions. It can be seen from the analysis in the paper that during the period before the financial crisis, when the PE enjoyed a kind of a boom, the takeover premiums significantly increased. That could also be connected to the situation described in the Axelson(2012), a better credit conditions, higher debt levels, however in this research it is also shown that the takeover premium is correspondingly higher. The ultimate conclusion of the paper is that the high tax shields of the PE firms, accrue as benefits to the vendors

of the companies to be LBOed, or the existing shareholders.

Hypothesis

As the previously reviewed literature attests, private equity is shown not to exert too much stress on the companies they acquire. That is in line with the suggestion that there are some 'natural', internal checks and balances, which preclude the excessive behaviour that otherwise could follow. As a result, the bankruptcy rate is broadly found not to be higher than similar companies, albeit with some qualifications. However, a gap in the literature could be found in studying the effect of multiple involvements of PE in a company or the so called SBOs. If PE cause financial distress then it could be expected that the SBOs and companies that are only acquired for the first time, are different and that the former default more often or are more distressed. In this master thesis I focus on this niche, as well a on the broader picture overall. Degeorge at al.(2016) investigated specifically the SBOs, though the study pertained to value creation and the timing of each transaction. Formally the hypothesis can be outlined as follows:

Hypothesis one or the **null hypothesis**, i.e. 'nothing is going on'. *Part I*: Private equity firms do not impose significant financial distress on acquired companies. Companies under PE do not default more often than comparable companies.

Part II: Secondary buyouts(SBOs) are not more saddled by debt compared to companies acquires for the first time by PE. There is no distinction in the rate of bankruptcy or failure between secondary buyouts and first time LBOed firms.

Alternative hypotesis. *Part I*: Private equity firms do indeed cause severe financial distress on the acquired companies. Companies under PE default more often than a comparable group of companies.

Part II: SBOs are saddled by the debt burden more than the companies acquired by PE for the first time. SBOs default or fail in higher numbers than the companies acquired for the first time in LBO.

Part III. Methodology

Evaluating the hypothesis stated requires empirical data. Therefore, information on deals that private equity firms have completed for a given period had been collected. That data is divided into subgroups, e.g. my hypothesis requires investigation on the differences between the secondary buyouts and companies acquired for the first time by PE. So the data has to be divided on those two samples. For each company, subject to private equity acquisition, financial/accounting information have, subsequently been collected. The justification is to track changes for the period before and after the involvement of a PE firm. There are two possible statistical relationships that are tested here. The first is how a measure of financial distress changes for the companies supported by PE, i.e. comparison of the same company before and after the acquisition. The second statistical relationship is how distressed are these companies compared to other group of companies that have not been subject to PE acquisition. The data collected for the companies in the sample is 'panel', i.e. observation for one entity throughout time. Therefore an econometric technique 'fixed effects' could ideally be used here to control for unobservable factors for each company and through time as well. In this thesis the fixed effect estimator had been used only for testing the change in financial distress for PE-backed companies.

A special attention is given on the construction of a so called control group. That process admittedly could never be perfect, but a careful design could mitigate some problems that can occur when the peer companies have to be chosen. In my thesis, I used the propensity score matching algorithm 'MatchIt' by Ho, Imai, et al(2011). The whole population of companies in the database are divided by an industry characteristic, in this case I used a first digit of a classification code(the European taxonomy, NACE Rev.2), therefore I ended up with ten groups of companies. That is, entities are divided into very broad groups of ten types of industries. Subdividing into more groups would be better, but also computationally more demanding, so the more efficient approach had been selected here. The next step is to find how many of the companies acquired of a PE are present in those ten groups, and label them 'treated'. Then the algorithm MatchIt is applied in order to find the best matches in each group for the companies in question. The criteria that the companies are matched are: total assets, EBITDA, interaction between totals assets and debt to

total assets, and EBITDA margin. I tested several different specifications, but that one appeared to produce best results for the data at hand. A caveat here has to be mentioned, i.e. the algorithm does not account for the panel data, so I averaged all observations for each company through time. Justification for that step is again to be found in the computational techniques–it merely gives a rough estimation of the main variables of the companies. Alternatively it greatly reduces the time for finding a match. In the end the companies have to be approximately of a same size, same indebtedness, same profitability, and it seems that that goal had been achieved relatively accurately. It has to be emphasised that similar leverage in control and treated companies is desirable in order for the comparison to be valid.

The next step in the data collection is to check how many of the companies acquired by PE, as well as selected similar control companies have failed or gone bankrupt. Here, different definitions of what constitutes a failure could be used. Sometimes the databases do not have a precise information on the status of the company and an approximation could be applied, with a careful description of the conditions in making one. The econometric method to be used here is a logit model when the failure/bankruptcy is coded as one and the rest as zero. In estimating such model, ideally a fixed effects panel data model should be used. In this study however, only logit model had been implemented, owing to coding bug in the package used for estimation. Another model that could be used instead of a logit one is the so called Cox regression, or time-varying hazard model. It uses a maximum likelihood estimation, accounting for the time an entity had actually survived. Alternatively, the latter models is used as a check for the robustness of the results.

My research question is subdivided into two parts–the effect on financial distress and the realized rate of failures/bankruptcies that the companies in the samples endure. For the former, there exist different measures for financial distress, but here the most widely used one, i.e. the Altman's Z-score is considered. Many people criticize using the Z-score, mainly questioning whether that variable is accurate. It had been computed on a historical data that may not necessarily reflect the future. Yet, despite such objections I think that the measure broadly correctly reflects the financial constraints that a company is encountering. The formula that is used in my thesis is the following:

$$Z = 1.2\frac{WorkingCapital}{TotalAssets} + 1.4\frac{retEarnings}{TotalAssets} + 3.3\frac{EBIT}{TotalAssets} + .6\frac{MarketValue}{TotalLiabilities} + .999\frac{Sales}{TotalAssets} \quad (1)$$

The testing for how much or whether financial distress increases after a PE acquisition is itself subdivided into two parts. First, the following regression is estimated on the whole sample including PE-backed and the control companies.

$$finDistress = \beta_1 + \beta_2 PEbacked + \beta_3(PEbacked * debt/totalassets) + firmControls + \epsilon_i \quad (2)$$

It is done so in order to compare the PE-backed firms to the constructed controls in a multivariate way. Here, important variable is the interaction variable of the dummy PE-backed and the measure for indebtedness–debt to total assets. Two specifications are estimated with the interaction term allowing for the slope at the coefficient of interest to change, i.e. not only controlling for the level of leverage, but also allowing for the different levels of it in both groups.

Alternative estimation of the equation (2) is the following (3).

$$finDistress = \beta_1 + \beta_2 PEbacked + \beta_3(PEbacked * interestCoverage) + firmControls + \epsilon_i \quad (3)$$

Here, the interest coverage had been used instead of the previous measure of indebtedness. According to prof. A. Damodaran interest coverage is the main factor determining the credit rating of a company, which itself determines the level of financial difficulties a firm is in. Therefore this regression would show an alternative estimates of the level of distress a PE backing impose on the acquired companies, controlling for other measure of the level of indebtedness. These estimations are needed for a more 'robust' view of the effects of a PE involvement.

The second part of the analysis of distress is done on a sample of the PE-backed firms only. The rationale here is to analyse how companies change under private equity. Specifically, a variable counting the years in PE is calculated, which would summarize how the financial distress evolves through time.

$$finDistress = \beta_1 + \beta_2(debt/totalassets) + \beta 3PEbacked + \beta_3 yearsSincePE + firmControls + \epsilon_i \quad (4)$$

The extra analysis on this level is needed to see how the distress in the PE-backed companies changes for the time before and after PE. On the other hand comparison can be made between first time PE-backed and SBOed companies. The expectation here is that the first timers would endure higher distress levels since the SBOs were already owned by PEs and accordingly they applied higher levels of leverage already. That is an important conclusion that could be made using this second part of the analysis, and not only comparing with the peer group companies. In this setting also it can be seen how PE firms manage companies while they own them, i.e. do they increase the financial distress after the acquisition or gradually reducing it. Conclusions could be drawn about the SBOs and the first timers.

Important control variables in these regressions are the debt to total assets, mentioned above. The debt is calculated as the sum of the short and long term debt. The logarithm of total revenues had been taken, measuring the size of a company. It is done so, since a large outliers could bias the estimated coefficients. Another control is the EBITDA margin, as a measure of profitability, and the EBITDA is used instead of EBIT or net income, since we want to account for the profitability parameter before interest payments, knowing that that item is significant in PE-backed companies. Another control is the logarithm of the age of a company, since probably the younger companies are more vulnerable. Expected signs from the regressions are negative for the indebtedness or the proxy for credit rating and positive for revenues and EBITDA margin, since the more sales or profit a firm makes the less distressed it would be.

Extra variable of interest in the regressions are the high yield bond spread, as indicated by the Axelson(2012). Here, it is assumed that the conditions are favourable in the credit market if this spread is lower than the median for the period, and conversely–unfavourable. Another, measure of interest is the experience of the PE firm that is doing the LBO. For this measure I arbitrarily assigned the dummy variable 'experienced' if the PE firm appeared five or more times as

an acquirer in a PE transaction. Admittedly, this is a crude measure, but may approximately give some indication about the matter. It assumes that this sample is taken randomly from the whole population of PE transactions, and PE firms are as active as in my data as they are as a whole, condition that could be true to a various degrees.

The research design outlined above is not perfect for testing a causal effect of the private equity acquisitions on the variable of interest, i.e. financial distress or bankruptcies. Nevertheless, using the 'fixed effects' model for the panel data could control for unobservable factors in each company, and hence partly improve the estimated coefficient. Another concern is how accurate the control group of companies had been constructed. Admittedly, a randomization here is infeasible, and only a random selection could be used in order for a causal relationship to be established. Despite all this, the control group had been carefully selected in order to give credibility of the estimated coefficients and final results.

A negative sign for the dummy variable and significance, would mean that PE firms indeed impose higher financial distress. The magnitude of that coefficient could also be interpreted as to what extent PEs burden the acquired companies. Comparison between first time acquired companies and the secondary buyouts is made by comparing the coefficients of the respective regressions. Here the interaction variable of indebtedness and the dummy of PE, could shed some more light on the effect of the PEs, namely controlling for the relatively higher debt in the private equity deals. Expectation of the favourable conditions variable are towards a higher distress in propitious conditions. Probably we would also expect a more experienced PEs to cause more financial distress, i.e. they can handle it better, and on the other hand to have lower bankruptcy rate.

Analysing the probability of default is the second part of the analysis. A logit model with the dependent variable equal to one if failure/bankruptcy occurs.

$$default = \beta_1 + \beta_2 PEbacked + \beta_3(PEbacked * debt/totalassets) + firmControls + \epsilon_i \quad (5)$$

The setting for the test to determine if PE-backed companies default more often is similar to the tests for the financial distress. That is the case since a multivariate analysis is needed to take into account the different levels of indebtedness as well as other control variables for the treatment

and control firms. The logit model is obviously required, due to the binary dependent variable. However that is not the only possible solution to the problem. The Cox regression hazard model is also a relevant estimation procedure, used in many papers, e.g. Hotchkiss et al.(2014). The difference here is that the hazard function used in estimating the coefficients is unspecified, using a method of partial maximum likelihood to estimate the best fit. Hence the model is more flexible in 'adapting' to the data it is applied to. That is different approach than the logit model, which for example uses a fixed function. As a result applying both techniques would give a better representation of the desired comparison between PE-backed and non-PE-backed firms.

Similarly to the previous part of the analysis, the causal effect would depend on the same conditions with the same conclusions. The results probably would point less towards a causal relationship between PE involvement and default rates.

Part IV. Data and descriptive statistics

The data used in this thesis is collected from various databases of Bureau Van Dijk(BvD). Specifically, information on the private equity deals is obtained from the Zephyr database. Here many different selections could be made, and a judgement call has to be made as to what is a 'private equity' acquisition. I used the classification 'IBO' or 'Institutional Buyout', and according to BvD that is 'acquisition where a Private Equity firm has taken a 50% stake or more in the Target company, or is the parent of the Acquirer'. That is a broad definition and yields a relatively large sample of around 18000 PE deals. Probably not all this deals are perfectly classified, but it would be assumed that they are, and therefore these are the PE transactions that would be analysed in this study. I tried to select deals based on a sub-category of 'leveraged buyout', which sounds appealing, but yielded only around 150 companies in the end. After that outcome I decided to use a much broader sample, with possible misclassification along the way. At that point the sample had been divided into first time PE-backed and secondary buyouts. It had been done as follows: the intersection of IBO and SBOs yielded the SBO sample, the first time PE-backed sample had been selected from IBO excluding SBOs. The former ended up in around 18000 deals, while the latter–4000. A time period limitation had not been imposed when downloading the data, aiming at obtaining the most

detailed information available in BvD. The following graph 1 shows the dynamics of the PE deals for the last twenty year.

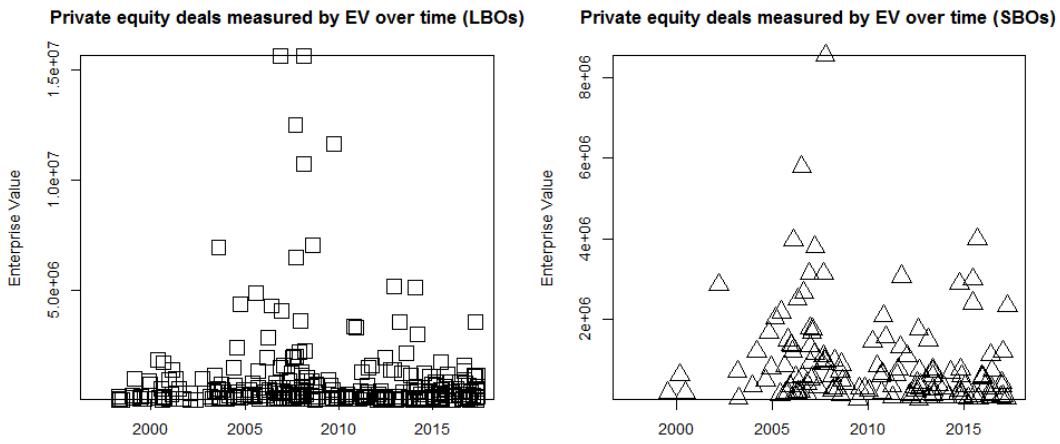

Figure 1: Private equity deals measured by enterprise value, through time.

The period represented in the graph is 1997 to 2017. The deals are divided into first time PE-backed(the left pane), and secondary buyouts(the right panel). The enterprise value(EV) is as supplied by BvD, i.e. equity(or market capitalization) plus short and long term debt minus cash. It is possible that some of this data are estimated and not entirely confirmed by a data source.

Using the enterprise value is the most accurate measure to make inferences over the deals in question, since it accounts for the debt as well as equity portion of a transaction. From the figure it can be seen that the PE industry had a boom pre- financial crisis, sharp decline and subsequent recovery, lasting until current period. The first time and secondary buyouts exhibit broadly similar trends. Some really big deals before the crisis are most notable in the figure. An explanation could be found in the especially good condition on the credit market at that time. The activity of PEs are relatively more subdued after the crisis, and that could be explained with some constraints on the availability of credit. SBOs are happening mainly from the second half of the 2000s, onwards.

Alternative measure for PE activity is the number of deals occurring. The following figure 2 illustrates the trend on that dimension.

We can see from the picture that the number of deals had grown exponentially from the late

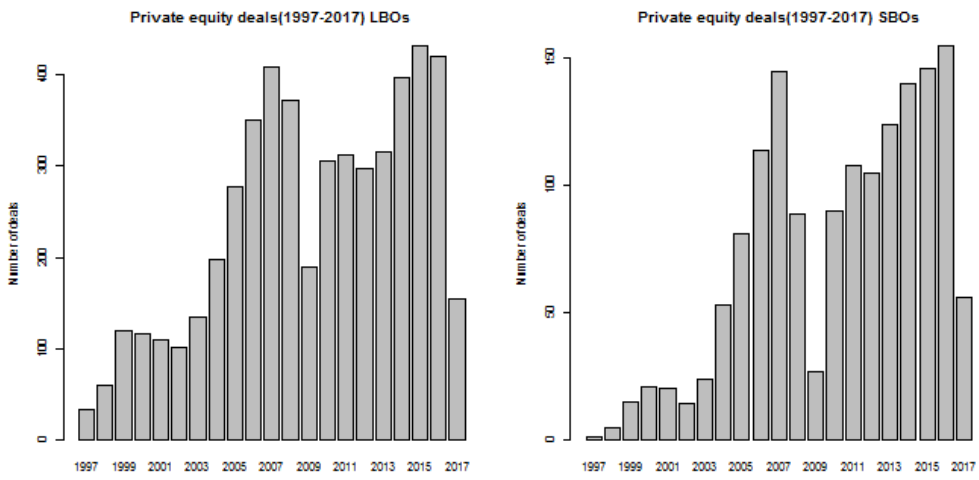

Figure 2: Number of private equity deals through time

The period in the graph is 1997 to 2017. A simple averaging had been done by each year and each sub-category. The right-hand panel reflects the first time PE-backed deals, while the left-hand exhibits the SBOs.

90s. Only a slight dip at the financial crisis and a strong recovery of the sheer number of deals. We can see that the activity of PE had been very stable in recent years according to the numbers, and comparing to graph 1, probably not with such a high profile deals as in the pre-crisis era.

In the appendix, additional information could be seen on the valuation multiple pre- and post-deal. From figure 3 it can be concluded that at the period prior to the financial crisis, the deals were valued more highly than after that event. That is true for both subsamples of first time LBOs and the SBOs. The magnitude of the valuation multiple is broadly similar for the first time PE-backed pre- and post- acquisition, whereas for the secondary buyouts it appeared that the companies were valued a bit lower after the deal than prior to the transaction.

Another characteristic of the analysed samples of companies is what types of industries they belong to. From the following table I it could be deduced that broadly there are not big differences between first time PE-backed and SBOed companies. The most often acquired companies are in computer software, data processing, engineering and so on.

In the appendix some extra information is supplied. For example the distribution of the

Table I: Number of deals grouped by industry

The number of deals are aggregated, using the European classification NACE.Rev.2. Only the first 12 entries are shown of a total of 471 different NACE codes for the upper panel of first time PE-backed, and 338 for the bottom panel of secondary buyouts.

First time PE-backed	
NACE Rev 2 description	Number of deals
Computer programming activities	202
Data processing, hosting and related activities	147
Engineering activities and related technical consultancy	97
Manufacture of other special-purpose machinery nec	90
Other software publishing	72
Manufacture of instruments and appliances for measuring, testing and navigation	67
Manufacture of other fabricated metal products nec	65
Manufacture of other outerwear	62
Business and other management consultancy activities	60
Manufacture of pharmaceutical preparations	53
Manufacture of other plastic products	52
Manufacture of medical and dental instruments and supplies	50
Secondary buyouts	
NACE Rev 2 description	Number of deals
Computer programming activities	64
Data processing, hosting and related activities	53
Engineering activities and related technical consultancy	27
Manufacture of medical and dental instruments and supplies	27
Other software publishing	24
Business and other management consultancy activities	22
Manufacture of other special-purpose machinery nec	21
Restaurants and mobile food service activities	21
Activities of employment placement agencies	19
Manufacture of other plastic products	18
Manufacture of pharmaceutical preparations	18
Manufacture of electronic components	17

country of the acquired companies, as well as the country of the PE firm can be found in table XIV. It is evident that for Europe the most active countries both as targets and PE sponsors are UK and France. Also, it should be noted that a large number of 'unknown' PE firms are in the sample, indicating the difficulties of obtaining information in some cases. Other extra information is exhibited in the table XV, where the most active PEs are grouped for the sample data at hand. We can see that well known private equity firms like 3I, Carlyle, CVC, Blackstone and so on, are among the most prolific actors on the European market. Those companies are also coded in the dataset as 'experienced'.

So far the characteristics of the private equity deals selected from Zephyr database, had been discussed. The next step of the data collection is to find the financial and accounting information for each company. That is done using the Amadeus database, which is also a part of the BvD services. It had to be noted that not for all companies selected in Zephyr there is a match in Amadeus. Therefore, the resulting sample that could be analysed gets smaller. Specifically for the first time PE-backed companies, information on about 4800 entities had been downloaded(from a

total of 18000), and respectively 1400(from a total of 4000) for SBOs. The most extensive search on Amadeus had been applied including the small companies as well. Using the results from the propensity score algorithm MatchIt, data on the selected peer companies is downloaded as well, specifically 4824 for the first group and 1396 for the second. In the following table II, the basic characteristics of the treatment(i.e. PE-backed) and control(i.e. non-PE-backed) companies could be examined.

Table II: Summary statistics PE-backed and control companies.

Key financial indicators for the treatment and control companies. The numbers are calculated by averaging the panel data throughout the years(i.e. from 'long' to 'wide' format of data). The number of companies in each sample is the same. The variable debt to total assets is winsorised at .001 level.

	First time PE-backed			
	Median		Mean	
	PE-backed	Controls	PE-backed	Controls
Total assets	26,424,678.20	21,709,196.88	474,898,632.27	9,350,237,383.61
EBITDA	2,106,280.50	1,194,625.00	42,539,122.50	169,818,323.03
EBITDA margin	7.82	8.16	9.36	13.39
Debt to total assets	0.25	0.21	0.48	0.36
	Secondary buyouts			
	Median		Mean	
	PE-backed	Controls	PE-backed	Controls
Total assets	52,293,508.89	35,413,294.00	657,300,588.79	2,432,165,524.90
EBITDA	3,696,014.71	2,103,500.00	40,804,451.52	154,987,327.03
EBITDA margin	9.61	8.33	10.33	14.24
Debt to total assets	0.35	0.26	0.93	0.43

Crucially from the table it could be seen that the companies have broadly the same size when we compare them using the median. The mean reveals that some outliers exist for both categories first time PE-backed as well as SBOs. Notably, the companies subject to private equity are rarely done on very large companies, although in the controls such companies are present. That is not a cause for concern, since the vast majority of companies have similar size. When it comes to EBITDA, similar conclusions apply. For the EBITDA margin we can see that the companies are very close in numbers. That is true for both groups of samples, as well as the mean and median dimension. The last indicator the one for indebtedness is the most important. It can be concluded

that the leverage of the companies had been matched quite accurately. E.g. a median of .25 for the PE-backed as opposed to .21 for the controls, pertaining to the first time LBOs, and .35 as opposed to .26 for the SBOs. The mean numbers show that outliers still exist, but for the sample as a whole, it can be concluded that it had been chosen relatively accurately. From table II also it can be seen that SBOs have much higher leverage ratios, as can be expected from the standard theory. The SBOs are somewhat different deals than the rest of PE acquisitions.

A more detailed view of the characteristics of companies in the target group, i.e. acquired by PE, can be seen in the following table III.

Table III: Summary statistics for the two groups(first time PE-backed and SBOs)

The data in the table is computed based on the last available year before a PE involvement. The data also reflect the dataset used to run the subsequent regressions, that is some of the values that are missing may be ignored along the way, resulting in fewer observations. Variables of indebtedness and interest coverage are winsorised.

	First time PE-backed						
	Min.	X1st.Qu.	Median	Mean	X3rd.Qu.	Max.	NA.s
Total assets	0	5,536,000	19,640,000	399,600,000	70,820,000	192,800,000,000	119
EBITDA	-2,562,000,000	344,800	2,248,000	50,340,000	7,720,000	18,480,000,000	759
Total revenues	0	6,419,000	24,640,000	313,200,000	74,390,000	152,100,000,000	1156
Enterprise value	2,867,000	8,767,000	38,300,000	5,355,000,000	242,400,000	92,230,000,000	2859
Interest coverage	-14.37	-0.06	4.46	28.01	24.72	187.5	1076
Debt to total assets	0	0.03	0.18	0.32	0.42	20.81	454
Acquired stake	0	75	100	85.51	100	100	967
	Secondary buyouts						
Total assets	2,500	16,470,000	48,670,000	533,000,000	157,000,000	216,900,000,000	31
EBITDA	-162,900,000	957,800	4,686,000	67,150,000	13,480,000	28,260,000,000	206
Total revenues	-1,140,000	9,032,000	35,430,000	550,000,000	100,300,000	192,200,000,000	405
Enterprise value	9,229,000	24,970,000	40,710,000	40,710,000	56,450,000	72,200,000	936
Interest coverage	-10.26	-0.01	2.44	20.59	13.36	177	275
Debt to total assets	0	0.08	0.31	0.44	0.60	16.00	123
Acquired stake	4.7	100	100	93.96	100	100	291

In this sample of companies the secondary buyouts tend to be somewhat bigger than the first time PE-backed, based on total assets or EBITDA. On the other hand though, based on the median enterprise value the two groups are roughly similar. Some outliers in the first group actually move the mean EV firmly in favour of first time LBOs. Other crucial feature of the studied two samples is that the SBOs are decidedly more indebted than the first time PEs, as can be expected, and is confirmed by the data. That is the case also with the second measure of financial health–the interest coverage(IC). The median IC is much lower for the SBOs than for the first group, indicating possible lower 'synthetic' credit rating. Finally, we see that the vast majority of deals are completed

for 100% of the shares, with the mean slightly higher for the SBOs.

The next step in assembling a dataset for running regressions is to compute the chosen measure of financial distress. A clarification should be made that in order to compute the Z-score, a simplification of the formula in the case of market capitalization had been done. Since the vast majority of companies in both samples are private companies, they do not have market value, instead the variable in Amadeus called 'shareholder funds/ capital' had been used. Still the numbers look plausible and I expect that this simplification would not bias substantially the measure for financial distress. The summary statistics can be seen in the following table IV.

Table IV: Summary statistics Z-scores for the two samples.

Z-scores are computed for the well known formula. The numbers are winsorised at the .001 level. That cut-off is somewhat lower in order for a greater precision, and also due to relatively few outliers in the data. Year 0 means the year of the PE acquisition, year -1 is the last available year, year 1 is one year after, and so on.

	First time LBOs						
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
Year -1	-3.309	1.209	2.246	2.415	3.285	25.12	1301
Year 0	-3.309	0.9723	1.92	2.226	3.015	25.12	1299
Year 1	-3.309	0.9881	1.838	2.219	3.003	25.12	1331
Year 2	-3.309	0.9954	1.877	2.202	2.944	25.12	1216
	Secondary buyouts						
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
Year -1	-3.037	0.9362	1.876	2.04	2.947	25.91	446
Year 0	-3.037	0.8618	1.702	2.066	2.845	25.91	457
Year 1	-3.037	0.9251	1.664	2.267	2.761	25.91	458
Year 2	-3.037	0.8171	1.64	2.136	2.664	25.91	440

The main conclusion from the table is that the financial distress following a PE acquisition declines substantially from 2.246 to 1.92, according to the median value for the first time LBOs. That is in stark contrast for the sample of secondary buyouts for which it only barely declined from 1.876 to 1.702. That is broadly in line with the standard theory and with what one would expect to find a priori. The other observation that could be made is that the financial distress improves slightly during first two years after the involvement for the first time LBOs, whereas it deteriorates during the same period for the SBOs, which is also what we would expect to find. Moreover, according to

the table, SBOs have higher distress levels than the first timers, and the Z-score of the secondary buyouts tends to decline with time. The mean numbers actually paint a different picture, but I would ignore them, since they reflect some outliers, and are not as representative as the median. The equal values for the minimum and maximum Z-scores, are identical and reflect the way that the data had been winsorised, i.e. the 0.001 quantile had been assign to all values that are greater or lower than it. This is a custom made, very simple function, that can be seen in the code supplied at the appendix. It had to be noted that alternative measures for financial distress could be computed.

The last step in the data collection is to find how the selected companies, i.e. PE-backed as well as non-PE-backed actually fare throughout time, or how often do they fail. Information about the default or bankruptcy rate is obtained from another database provided by Bureau Van Dijk–Orbis. In Orbis a variable of interest is the one called 'status', i.e. there are multiple categories, e.g. 'active', 'dissolved' and so on. For this analysis to characterise a company as failed or bankrupt, a four categories of the variable status are chosen. Those are: 'active(default on payment)', 'active(insolvency proceedings)', 'bankruptcy' and 'dissolved(bankruptcy)'. There could be a discussion as to how accurately the events are coded by BvD, but a judgement call had to made and for this study, and the afore mentioned information had been grouped into 'failed' companies. A cautionary note should be added here–companies coded as 'dissolved' are a bit ambiguous. According to BvD it means 'the company no longer exists as a legal entity, but the reason for this is not specified', so possibly some of these companies are also bankrupt/failed, but others could well not be. The decision is to stick with the afore mentioned four categories, and probably as a robustness test, it can be tested, to check what the impact of these companies would be by adding the category 'dissolved' to the overall 'failed' category.

The data is obtained as follows, all companies PE-backed as well as non-PE-backed are grouped together. The datasets are divided into first time PE-backed and SBOs. Information about the bankruptcy status is obtained from Orbis for both enlarged samples. Then a dummy variable is created equal to one if 'success', i.e. bankruptcy had occurred and zero if not. Another caveat is that the information in Orbis is rather limited for the period selected. Data is available only after 2008, even though my sample encompasses much broader time span. Still, that is a good period for making inferences.

High yield bond spread is obtained from FRED database, i.e. the US Federal Reserve. The spread reflects the difference in interest rates between high yield(or 'junk') bonds and the investment grade rated bonds.

Part V. Results

The analysis is divided into two parts. Detailed investigation into how PE firms affect the financial health of the companies they acquire, and the second part is studying whether the companies under PE actually fail more often than the companies that are not backed by financial sponsor. The analysis of financial distress itself is divided into two parts, i.e. comparison with the matched control companies, as well as investigation of how PE-backed entities fare compared to the time before the acquisition by PE. All calculations are done on the two divided samples: first time PE-backed and SBOs.

Part V.A.a. Financial distress analysis PE-backed compared to non-PE-backed

The question we would like to answer in this part of the study is how much financial strain the PE backers impose on the companies they acquire. Since in theory the companies that change hands from one PE firm to another are deemed to have somewhat different circumstances than the rest, two different tables with results are computed. The regressions for the obviously bigger sample of companies backed for the first time of PE firm are summarized in table V.

In the table the control variables are represented by the size of the company measured as the logarithm of total revenues and the profitability measure through the EBITDA margin. Both are highly significant and positive throughout all specifications, in line with what could be expected. The bigger and more profitable firm are likely to have better financial health. The other crucial control variable is the level of indebtedness. Two measures are used to test for that effect: the debt to total assets and the interest coverage. Inclusion of these variables would aim to show the effect on financial distress (measured by Z-score), but taking out the leverage that influences each company. That way a clearer distinction could be made between PE-backed and non-PE-backed.

Table V: Regressions, financial distress: first time PE-backed and controls

Dependent variable is the Z-score. Regressions run on the whole sample–first time PE-backed companies plus matched control ones. Panel data 'random' effects used, the observation of the PE-backed for the period prior to acquisition are excluded. Clustering is done on the company level, HC0 standard errors are used for the panel estimation. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	2.032***	1.626***	2.056***	1.613***	0.152	0.164
	-0.091	-0.242	-0.261	-0.239	-0.168	-0.168
Debt to total assets	-2.081***	-1.215***	-2.08***	-1.124***		
	-0.033	-0.233	-0.283	-0.24		
Log(total revenues)	0.08***	0.066***	0.08***	0.066***	0.094***	0.094***
	-0.004	-0.011	-0.01	-0.011	-0.009	-0.009
EBITDA margin	0.003***	0.013***	0.003**	0.013***	0.007***	0.007***
	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
Quoted	-0.531***	-0.273	-0.534***	-0.271	-0.165	-0.165
	-0.08	-0.221	-0.138	-0.22	-0.241	-0.241
Log(age firm)	-0.07***	0.03	-0.078**	0.023	0.144***	0.142***
	-0.021	-0.044	-0.04	-0.043	-0.037	-0.037
PE-backed	-0.396***	-0.383***	-0.39***	-0.146	-0.288***	-0.32***
	-0.03	-0.058	-0.05	-0.108	-0.053	-0.055
PE-backed * debt total assets				-0.761**		
				-0.297		
Interest coverage					0.007***	0.006***
					0	0
PEbacked * interest coverage						0.002**
						-0.001
Panel data random effects	no	yes	yes	yes	yes	yes
Panel data time effect	no	no	yes	no	no	no
$R\hat{2}$	0.119	0.077	0.121	0.079	0.089	0.089
adj.$R\hat{2}$	0.118	0.077	0.121	0.079	0.089	0.089
N	36101	36101	36101	36101	29328	29328
Standard errors in parentheses						

The first regression specification is a simple OLS one, while the rest are panel data regressions. An important caveat has to be emphasised here, i.e. the best way to estimate this regressions is to use the 'fixed' effects model. However I was unable to do that, since that would imply matching precisely each PE-backed to each control company, and then assigning a dummy for each control company, designating an artificial pre- and post- acquisition. That is possible to do, the matching algorithm has to be run for each of the more than 6000 companies, which would take computational time. As the least bad option in the following two tables the panel data 'random' effects are used. It is not perfect but better than the normal OLS. We can see that for the specifications with debt to total assets, the PE-backed companies are indeed more financially constrained. According to

regression (2), a PE-backed company would have on average .38 lower Z-score. It should be noted that not big difference could be discerned for the different types of regressions. The important point here is regression (4), in which an interaction term for the debt variable and the dummy for PE, has been added, to allow for the different levels of debt for the PE and non-PE companies. It has a highly significant negative coefficient, but the more important finding is that the dummy for the PE-backed is insignificant, implying that taking into account the varying leverage, the two types of companies are not different in terms of distress. The rest of the specifications in table V are accounting for indebtedness using the interest coverage. Here broadly the same picture, but slightly lower coefficient, also the interaction variable actually increases our coefficient of interest. That could be explained with the possible differences in the interest coverage and the debt variable. In line with theory the coefficient is positive, if low in magnitude, reflecting that higher interest coverage predicts better outcome for the financial distress.

Other variables of interest are the age of a company and a dummy for whether it is publicly listed. In the most credible regression (2), both variables are insignificant, perhaps surprisingly. According the (5) and (6), the age of the firm is actually exerting positive influence on the financial distress, which is what would be expected normally, i.e. older firms probably are likely to be in better health. We would also expect that the quoted companies are also better in terms of Z-score, but in specification (1) and (3), it is actually negative. One explanation is that some of them are downsizing their activities, but also it should be noted that only 2% of the companies in the sample are public, so probably these estimates are a statistical fluke.

The same analysis had been performed for the second sample of secondary buyouts. The results are in table VI(identical to table V). The first impression from the numbers in the table is that they are very similar to the ones analysed so far.

The coefficients of interest, the dummy of PE-backed, is almost the same, albeit slightly lower, regarding the most trustworthy specification (2). The main conclusion here is that the PE firm do not impose higher burden on the SBOs, as some could expect. On average their Z-score is likely to be only .37 lower than the controls. However, here including the interaction term of debt and the PE dummy, actually yields insignificant coefficients for all the variables in (4). Here, possible problems

Table VI: Regressions, financial distress: SBOs and control companies

Dependent variable is the Z-score. Regressions run on the whole sample–SBOs plus matched control companies. Panel data 'random' effects used, the observation of the PE-backed for the period prior to acquisition are excluded. Clustering is done on the company level, HC0 standard errors are used for the panel estimation. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	1.701***	1.176	1.703***	1.16*	0.554	0.571
	-0.156	-0.717	-0.595	-0.688	-0.377	-0.376
Debt to total assets	-2.047***	-0.829	-2.046***	-0.658		
	-0.06	-0.877	-0.671	-0.925		
Log(total revenues)	0.086***	0.078***	0.086***	0.078***	0.069***	0.069***
	-0.007	-0.014	-0.015	-0.014	-0.014	-0.014
EBITDA margin	0.005***	0.011***	0.005**	0.011***	0.008***	0.008***
	-0.001	-0.002	-0.002	-0.002	-0.001	-0.001
Quoted	-0.441***	-0.252	-0.441*	-0.234	-0.371**	-0.376**
	-0.157	-0.244	-0.255	-0.251	-0.161	-0.159
Log(age firm)	-0.055	0.005	-0.055	-0.012	0.072	0.069
	-0.035	-0.112	-0.078	-0.104	-0.091	-0.091
PE-backed	-0.467***	-0.369***	-0.466***	0.085	-0.195	-0.233*
	-0.055	-0.112	-0.095	-0.329	-0.121	-0.121
PE-backed * debt total assets				-1.365		
				-0.935		
Interest coverage					0.008***	0.008***
					-0.001	-0.001
PEbacked * interest coverage						0.002
						-0.002
Panel data random effects	no	yes	yes	yes	yes	yes
Panel data time effect	no	no	yes	no	no	no
$R\hat{2}$	0.133	0.048	0.133	0.054	0.102	0.102
adj.$R\hat{2}$	0.132	0.048	0.133	0.054	0.102	0.102
N	9973	9973	9973	9973	8186	8186
Standard errors in parentheses						

with the regression could had occurred, or if that is not the case it again shows that the SBOed companied are not more likely to be distressed than the controls. For the (5) and (6), broadly similar conclusions. In the case when not including the interaction, the PE dummy is insignificant again, whereas with it, the PE-backed are only .23 lower than the controls. The age of the firm and whether it is listed does not appear to influence the level of financial distress.

Key takeaway from this part of the analysis is that the increase of the level of financial distress compared to the peer group of companies is virtually identical, regardless of the fact of multiple PE involvement in a company. Compared to the existing literature e.g. Tykvova and Borell(2011) found that financial distress increases but with much lower value of -.13, which can be explained

with the different sample they use, and different control variables they employ. Nevertheless, main finding has the same direction, and the authors do not consider SBOs.

Part V.A.b. Financial distress analysis–changes in the PE-backed companies

The second part of the analysis concerns how financial distress changes for companies undergoing a PE acquisition. Notably in this part of the analysis the control companies are excluded. Therefore the panel data 'fixed' effects could be used, since we can use the dummy for the takeover to run the analysis and compare what happens for the time a company is supported by a PE. Again, the two tables are computed, for the two samples. In the table VII the results are summarized. The same control variables had been used and they have the same predictable meaning the debt decreases the Z-score, while size and profitability increase it.

Table VII: Regressions on the sample of only first time PE-backed companies

Dependent variable is the Z-score. Regressions run on the sample–first time backed, without controls. Panel data 'fixed' effects used, apart from specification (5). Clustering is done on the company level, HC0 standard errors are used for the panel estimation. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	2.117***				1.801***		
	-0.084				-0.337		
Debt to total assets	-1.922***	-0.935***	-0.935***	-0.934***	-1.099***	-1.536***	-1.539***
	-0.034	-0.266	-0.266	-0.266	-0.29	-0.171	-0.17
Log(total revenues)	0.039***	0.046**	0.046**	0.047**	0.037**	0.052**	0.052**
	-0.005	-0.02	-0.02	-0.02	-0.017	-0.025	-0.025
EBITDA margin	0.012***	0.024***	0.024***	0.024***	0.021***	0.02***	0.02***
	-0.001	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003
PE-backed	-0.143***	-0.104***	-0.105***	-0.103***	-0.108***	-0.025	
	-0.025	-0.03	-0.03	-0.03	-0.03	-0.04	
Experienced			0.008				
			-0.049				
Favourable				-0.024			
				-0.025			
Log(age firm)					0.022		
					-0.06		
Years since PE acquisition						0.003	0.001
						-0.01	-0.01
Panel data 'fixed effects'	no	yes	yes	yes	no	yes	yes
Panel data 'random effects'	no	no	no	no	yes	no	no
$R\hat{2}$	0.16	0.14	0.14	0.14	0.145	0.135	0.135
adj.$R\hat{2}$	0.16	0.122	0.122	0.122	0.145	0.104	0.104
N	20596	20596	20596	20596	20550	9382	9382
Standard errors in parentheses							

The first regression is a normal OLS, whereas the rest use the 'fixed' effects model, which is more credible and to be preferred. Nevertheless, the differences are not big anyway. The overall conclusion that could be made is that the financial distress for the companies increases after the involvement of a PE, however the magnitude of the coefficient is much lower than in the previous section, the comparison with the controls. The coefficient is down from .38 to .10, which suggests that the PE firms do not put excessive strain on the acquired companies. Here also the extra hypothesis is tested whether the selected 'experienced' companies are different than the rest and it can be seen that it is highly insignificant, which can be interpreted that the those PE companies are not more daring or cautious. The favourable credit conditions also are not significant predictor of financial distress according to regression (4). That runs counter to the existing literature, e.g. Axelson(2012). These are the results for the particular sample in question, and some of the deals may be misspecified, or simply that could be the relationship. The age of the firm also does not influence the the distress level significantly, also other studies found that it has an impact, notably Wright and Wilson(2013). Here, because the age does not vary through time again 'random' effects are used instead of 'fixed'. Finally the variable that accounts for how many years a company is supported by a PE firm is also insignificant. That is an important variable suggesting that the PE firms do not increase the distress with each year under their ownership, which is a positive characteristic, implying rather prudent behaviour on the side of PEs.

Similar analysis but for the secondary buyouts is shown in table VIII. The main conclusion is that companies that are subject to SBOs are much less burdened in terms of financial distress, than the first time LBOs. That could be discerned by the dummy coefficient in regression (2)–it is only .06 as opposed to .104 from the previous section. That is also in line with what could be expected, and the theory predicts, i.e. those companies already have been under PE and presumably had borrowed accordingly. Therefore their financial distress decreases less than the first time PE-backed. The 'experienced' and the age dummy are also found to have no effect on or variable of interest. However for the SBOs the favourable credit condition actually exhibits the expected effect, i.e. when credit is easy then the distress is higher, or the PE firms become more daring. On the other hand we can find that for each year a company is under PE, the financial distress increases(Z-score decreases) by .028 for each year of PE involvement, which is significant at 5% level. That is different

Table VIII: Regressions on the sample of only secondary buyouts

Dependent variable is the Z-score. Regressions run on the sample–SBOs without control companies. Panel data 'fixed' effects used, apart from specification (5). Clustering is done on the company level, HC0 standard errors are used for the panel estimation. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Intercept)	1.928***				1.129*		
	-0.137				-0.593		
Debt to total assets	-2.504***	-1.407***	-1.407***	-1.41***	-1.57***	-1.519***	-1.524***
	-0.062	-0.181	-0.181	-0.184	-0.192	-0.147	-0.147
Log(total revenues)	0.048***	0.083***	0.083***	0.089***	0.069***	0.076	0.075
	-0.008	-0.024	-0.024	-0.024	-0.021	-0.051	-0.051
EBITDA margin	0.009***	0.018***	0.018***	0.018***	0.016***	0.019***	0.019***
	-0.001	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003
PE-backed	-0.071*	-0.062*	-0.062*	-0.047	-0.048	-0.064	
	-0.04	-0.032	-0.032	-0.031	-0.034	-0.047	
Experienced			-0.006				
			-0.006				
Favourable				-0.104***			
				-0.034			
Log(age firm)					0.031		
					-0.136		
Years since PE acquisition						-0.022	-0.028*
						-0.016	-0.015
Panel data 'fixed effects'	no	yes	yes	yes	no	yes	yes
Panel data 'random effects'	no	no	no	no	yes	no	no
$R\hat{2}$	0.253	0.206	0.206	0.209	0.204	0.162	0.162
adj.$R\hat{2}$	0.252	0.181	0.181	0.184	0.203	0.127	0.126
N	5530	5530	5530	5530	5530	2405	2405
Standard errors in parentheses							

than the first time PEs and is a rather negative development. It suggests that those companies hypothetically are exposed to more financial distress further into PE ownership. It also confirms the higher financial strain that SBOs are exposed to.

Part V.B. Analysis of bankruptcies/failures for PE-backed companies against non-PE-backed

The analysis of part A, dealt mainly with financial distress, which although indicative may not paint the whole picture. In this section it is examined whether the companies acquired by PE firms actually default more often than their non-PE-backed brethren. In a familiar fashion two table are printed summarizing the results for the two samples of interest. In the next table IX the results for

the first time PE-backed companies could be seen.

Table IX: Regressions, bankruptcy: first time PE-backed and control companies

All regressions are run using simple logit model. The dependent variable is equal to one if a company fails/defaults. Standard errors are computed using 'HC0' method. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)
(Intercept)	-2.307***	-2.305***	-1.016***	-0.203	-2.115***
	0.284	0.284	0.312	0.557	0.283
Debt to total assets	0.168***	0.192***	0.081	0.062	0.172***
	0.044	0.046	0.052	0.073	0.042
Log(total assets)	-0.081***	-0.082***	-0.116***	-0.209***	-0.079***
	0.017	0.017	0.018	0.032	0.016
EBITDA margin	-0.018***	-0.018***	-0.015***	-0.014***	-0.018***
	0.001	0.001	0.001	0.001	0.001
PEbacked	0.154*	0.188*	0.065		0.155*
	0.078	0.082	0.088		0.078
PE-backed * debt to total assets		-0.086			
		0.084			
Z-score			-0.298***		
			0.027		
Experienced				0.849***	
				0.133	
Favourable					-0.486***
					0.07
N	37065	37065	29883	9358	37065
Standard errors in parentheses					

From the table the conclusion is that the PE-backed companies default more often than the non-PE-backed ones. The result is significant only at 5% level. Controlling for the leverage in specification (2) even increases slightly the coefficient, meaning even for companies with same indebtedness the rate is not lower. The Z-score from (3) has the predictable negative sign, i.e. the higher the score the lower the rate of bankruptcies, and even in that case the dummy of PE-backed is insignificant. It suggests that for companies with same Z-scores the default rate does not differ. The 'experienced' dummy in (4) is highly significant and shows that for supposedly 'better' PE firms with more acquisition the default rate is higher. That is perhaps surprising, or maybe it reflect the fact that more companies in the sample are managed by them. On the other hand the 'favourable' dummy is significant and has the predictable negative sign. It suggests that during better credit conditions the companies default less, on average(or what the theory would predict).

For comparison with the SBOs the next table X can be used. A priori we probably would expect that the SBOs default more often since they probably could not find strategic investors and are still in the hands of a PE manager. On the other hand, from previous analysis, it was evident that the longer a company is owned by PE in SBO, the higher the financial distress it endures. But the regressions in the table show a rather different picture.

Table X: Regressions, bankruptcy: secondary buyouts and control companies

All regressions are run using simple logit model. The dependent variable is equal to one if a company fails/defaults. Standard errors are computed using 'HC0' method. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)
(Intercept)	-3.814***	-3.793***	-1.348	1.453	-3.235**
	1.009	1.01	1.061	3.475	1.021
Debt to total assets	0.204*	0.137	0.212	0.595*	0.183*
	0.086	0.091	0.202	0.284	0.091
Log(total assets)	-0.023	-0.023	-0.132*	-0.344 .	-0.021
	0.057	0.057	0.202	0.198	0.057
EBITDA margin	-0.022***	-0.022***	-0.014***	-0.019**	-0.023***
	0.003	0.003	0.003	0.005	0.004
PEbacked	-0.303	-0.594 .	-0.066		-0.298
	0.274	0.328	0.295		0.275
PE-backed * debt to total assets		0.56 .			
		0.308			
Z-score			-0.309**		
			0.099		
Experienced				-0.465	
				0.729	
Favourable					-0.811***
					0.229
N	7106	7106	5476	1831	7106
Standard errors in parentheses					

From the table it can be seen that the coefficient on the PE dummy is insignificant, implying that there is no difference in the the bankruptcy rate between treatment and control companies. The interaction variable for the debt level is marginally significant at 10% level, and if anything in that case the dummy on the PE-backed is negative and marginally significant at 10%. It would mean that the non-PE-backed companies default more often. The Z-score here again have the predictable negative sign, implying lower bankruptcy rate for higher number or better financial health. Interestingly here the 'experienced' dummy has a negative sign which should had been

expected(i.e. more experienced PE to have lower incidence of failure), although that number is not significant. The dummy for good credit condition is again highly significant and has a negative sign entirely what theory would predict.

Part VI. Robustness checks

The credibility of the results of this study depend on the companies in the control sample. If the firms to be compared have similar characteristics to the PE-backed ones, and no systematic bias exist in selecting them, i.e. they are chosen randomly, then the results could be considered as a causal effect of the PE involvement. However, those conditions are unlikely to be fully fulfilled in the analysis at hand. A special care had been given in the way the matched firms had been identified, but likely this artificial construction of control group, could have introduced some non-random biases. Given that it is difficult to find some truly exogenous variation regarding PE and non-PE firms, we can consider that this selection is the least bad option. The results found could lean more towards correlation rather than causation.

I have run a kind of robustness test in the following mould. The control group constructed was twice the size of the treated PE companies. Then a random sample had been taken from that group with the size of the treated units. Consequently, the whole analysis had been performed. After that another random sample had been taken and again the results had been calculated, which were very similar to first ones. Admittedly the bigger sample still had been chosen based on the algorithm, but it gives some notion of robustness. The extra tables, thus computed, are not part of the thesis, but are available upon request.

Possible another problem that could arise, is regarding the control variables. In running the regressions I could have used more sophisticated controls. Examples include more controlling for industry levels of variables, as well for levels of concentration of industries, or other external factors that could somehow influence the companies in question. These extra control variable could remove some of the possible biases, that are probably present in the current specifications.

The quantification of the characteristic of financial distress is also subjective, and possibly

imprecise. The Altman's Z-score had survived many decades of financial literature, but still may introduce some version of bias. To partially remedy this a different measure could be computed.

Estimation problems include the inability to run the 'fixed' effects panel regression in tables V and VI. A better matching process for each company could also solve this problem. When it comes for the second part of the analysis concerning the bankruptcies, again econometric problem exists. The logit model used does not implement the much desired 'fixed' effects. The reason is a bug in the R code that I could not resolve in time. Nevertheless, the results are still credible. As a robustness measure the same comparison for the bankruptcy rates is done using another technique, namely the so called Cox regression. The results are presented in table XI and XII, for the first time PE-backed and the SBOs respectively.

Table XI: Cox regression, bankruptcies: first time PE-backed companies

Cox proportional-hazards regression model had been estimated on the same data as in the table IX. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)
Debt to total assets	0.090***	0.141***	0.049	-0.012	0.099***
	0.021	0.026	0.033	0.041	0.023
Log(total assets)	-0.085***	-0.087***	-0.112***	-0.188***	-0.080***
	0.017	0.017	0.894	-0.014***	0.017
EBITDA margin	-0.017***	-0.017***	-0.012***	0.002	-0.018***
	0.001	0.982	0.001		0.001
PEbacked	0.151*	0.199 .	0.066		0.138 .
	0.075	0.077	0.082		0.075
PE-backed * debt to total assets		-0.103*			
		0.047			
Z-score			-0.273***		
			0.024		
Experienced				0.883***	
				0.129	
Favourable					-20.235
					715.95
N	37065	37065	29883	9358	37065
Standard errors in parentheses					

The results are pretty similar indicating the 'robustness' of the findings. For the first time PE-backed the coefficient on the dummy of PE is almost identical however including the interaction term it is only marginally significant at 10% level. It could be concluded that the differences in defaults are probably not as big as the logit regression implies and the true relationship is that they are more or less similar. The other characteristics of interest are broadly of the same meaning and magnitude with the exception of the favourable dummy, which is insignificant in the Cox regression.

The table XII, showing the results for SBOs, also confirms the findings of part V.B. However

in specification (1), the coefficient of the dummy on PE-backed is actually negative and significant at 5%, implying that the SBOed companies default less often than non-PE backed ones. That result is in the same direction as in table X, and acts as a 'robustness' check. The second specification, including the interaction term of the indebtedness level renders the PE dummy again marginally significant at 10% level, corroborating the broad conclusion that there is not a difference in the default rates between SBOs and the non-PE-backed controls. The Z-score and the experienced variables have similar coefficients, and the dummy indicating the favourable credit conditions is again insignificant in this regression estimation, which is rather inconsistent with the main narrative from the previous section.

Table XII: Cox regression, bankruptcies: secondary buyouts

Cox proportional-hazards regression model had been estimated on the same data as in the table X. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	(1)	(2)	(3)	(4)	(5)
Debt to total assets	0.232*	0.172*	0.199	0.505 .	0.168 .
	0.101	0.139	0.190	0.266	0.088
Log(total assets)	-0.028 .	-0.028 .	-0.141*	-0.341*	-0.025
	0.055	0.055	0.060	0.142	0.055
EBITDA margin	-0.021***	-0.021***	-0.014***	-0.018*	-0.023***
	0.003	0.005	0.004	0.009	0.003
PEbacked	-0.295*	-0.518 .	-0.027		-0.284
	0.261	0.312	0.275		0.262
PE-backed * debt to total assets		0.407			
		0.267			
Z-score			-0.304***		
			0.085		
Experienced				-0.456	
				0.762	
Favourable					-19.883
					1790.059
N	7106	7106	5476	1831	7106
Standard errors in parentheses					

A different point of view in checking for robustness of the findings of this study is to examine the various specifications of the company status in Bureau Van Dijk data. There are a large number of companies that are classified as 'dissolved'(as much as the defaulted ones, indeed), which as the information provider explains are with an 'unknown' fate. That leaves the possibility for some of those 'dissolved' companies to be instances of bankruptcies that are not included in the standard classification. A hypothesis like this one could of course lead to a bias. On the other hand the companies could be dissolved for other than insolvency problems, in which case they should not have been included into our binary outcome variable. A possibility also exists that these companies have

been dissolved to avoid bankruptcy, which can not be be confirmed definitely, solely based on the BvD data. For these reasons, I decided to group all companies coded as defaulted/bankrupt/dissolved in one category and run again the whole analysis to see what direction the coefficient takes and what possible implications that could have for the final conclusion. The results are presented in table XIII.

Table XIII: Regressions, bankruptcies plus 'dissolved' companies: both samples.

Logit regression model had been estimated on the same data as in the tables IX and X. The dependent variable is equal to one if a company in BvD have a status 'dissolved', 'bankruptcy', 'default on payment', 'insolvency proceedings'. Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 .

	First time PE-backed		SBOs	
	(1)	(2)	(3)	(4)
(Intercept)	-2.258***	-2.262***	-2.267***	-2.26***
	0.223	0.223	0.665	-0.633
Debt to total assets	0.202***	0.235***	0.172*	0.166*
	0.044	0.05	0.08	0.078
Log(total assets)	-0.053***	-0.053***	-0.065 .	-0.065 .
	0.013	0.013	-0.036	0.038
EBITDA margin	-0.009***	-0.009***	-0.007*	-0.007*
	0.001	0.001	0.003	0.003
PEbacked	0.334***	0.381***	0.112	0.092
	0.056	0.061	0.158	0.214
PEbacked * debt to total assets		-0.127		0.052
		0.081		0.37
N	37065	37065	7106	7106
Standard errors in parentheses				

From the table it could be seen that for the first time PE-backed firms the coefficient of the dummy is highly statistically significant, positive and in much higher magnitude than in table IX. That result would imply that including all these extra 'successes' in the logit regression, and given that all the companies experience default like circumstances, the PE-backed companies endure bankruptcy more often than the control ones. That is the case even if the interaction variable controlling for the level of debt had been included. On the other hand, the second part of the table exhibiting the results for the SBOs still imply that there is no difference in default rates between the two categories, i.e. the coefficients in (3) and (4) are insignificant. So, to sum up: including the category of 'dissolved' in the analysis does not alter the conclusion for the secondary buyouts, but raises more questions for the first time PE-backed companies, since their incidence increases. With the caveat that not all of those occurrences comply to our definition, it could be concluded that

those findings corroborate the main narrative of the study.

Part VII. Conclusion / Discussion

In this master thesis I inquired into the effects that a private equity acquisition could have on the financial distress and bankruptcy possibility for a company. The study had been conducted only for European firms, using the information from Bureau Van Dijk. The research time period for the companies in the dataset is the maximum available from the BvD. The measure for financial distress is the Altman's Z-score. A special attention had been given on the differences between companies acquired for the first time by a PE investor and firms subject to multiple involvements of PEs, which is also my contribution to the literature. A propensity score matching algorithm had been implemented for the selection of the control group of companies for statistical comparison. It had been found that the PE investors indeed increase the financial distress in companies, albeit not excessively. Regarding the two samples of companies, first time PE-backed and the secondary buyouts are almost identical in the amount of strain exerted by the PE investors in comparison with non-PE-backed ones. The investigation into the effects pre- and post-acquisition for the same company, yielded that the SBOs are burdened less, in comparison with the first time PE-backed firms, and the deterioration in financial distress measure is much less than in the comparison with the peer group of control firms. However, the financial health measure worsens, when time progresses for the SBOs, whereas that is not the case for first time PE-backed companies. The second part of the analysis concerns the bankruptcy rates the selected companies in both groups endure. The major finding is that the secondary buyouts do not exhibit higher rates of default than the peer group, and on the other hand the first time PE-backed firms appear to default more often.

In terms of the hypothesis tested, regarding the financial distress a support is found towards the alternative one, i.e. PE impose a higher burden on companies, probably not excessively so. The other part of the hypothesis, support for the null is found for the SBOs, whereas the alternative is the conclusion for the larger group of first time backed companies. For the second part of the hypothesis, support for the null is evident, i.e. SBOs do not perform poorer than the other PE-backed companies, or no worse results for the failure rate, even though the financial distress could be higher.

My findings are broadly in line with the existing literature, albeit with slight nuances of some results. Hotchkiss et al.(2014) found that controlling for leverage the PE-backed firms do not default more often, and Tykvova and Borell(2012), also found no significant differences, whereas Wright and Wilson(2013) found a greater incidence for the PEs. Stromberg(2007) found lower overall rate for the PEs, albeit not in a multivariate analysis. Even though in my findings the much bigger group of companies(first time PE-backed), default more often, the coefficient is not high and in a robustness test of Cox regression, had been losing significance, so I could conclude that controlling for various factors PE involvement do not lead to excessive defaults and that the PE investors do not appear to be reckless.

Numerous limitations exist in my research, which have to be taken into account when the results are interpreted. I will point out several of them. The identification of private equity involvement had been entirely left to BvD, and some casual probing of the dataset suggest that this may not always been done accurately. Therefore if companies had not been selected properly a possible bias could occur. On the other hand the peer group is an obvious approximation to the golden standard of the randomized control trial. Methodological issues also exist, in the inability to apply the 'fixed' effects model, thereby controlling for an unobservable factors, eliminating bias. On the other hand, controlling precisely for the time of exits had not been done as well, due to the complexity of identifying and coding, and could be a subject for future research. Finally, whereas the time period of the first part of the analysis had been done on fairly long time span, thereby lending more credibility to the results, the information on the defaults had been rather limited and encompasses only the last 8-10 years. That, coupled with the ambiguity of the default event in the BvD database Orbis, may suggest that the true relationship could deviate from the results of the regressions in the thesis. A limitation in the analysis of financial distress measures is that it is based entirely on accounting information at the level of the company in question. and an extra debt could be held at a private equity fund level. The information on the overall debt level in a PE deal is hard to be collected, and consequently had been ignored in this study. Needless to say, in such cases possible biases could emerge, and when conclusions are made that caveat should be mentioned. Inclusion of extra, external, control variables could improve the precision of the results.

Implications of the findings of the study are towards the confirmation of the notion of relative

prudence and the existence of internal checks and balances in the private equity firms. The findings are also consistent with the model devised in Axelson(2009), which suggests that the structure of financing and the internal organization of a private equity firm and affiliated funds is made in such a way as to reduce the incentives to use excessive leverage and to diminish the ability of taking unjustifiable risk. Therefore an implication to the policy makers and the society at large is not to constrain excessively the activities of private equity firms, since a body of research has shown numerous positive effects of their involvement in the companies' financing. Moreover, the thesis deals with European data, consequently it should be emphasised that after the financial crisis of 2008-09, the European Commission adopted new Directive 2011/61/EU on Alternative Investment Fund Managers(AIFMs). This legislation is designed to rein in the possible excesses that AIFMs could venture in. Specifically, Article 25 of the document deals with the amount of leverage each AIFM takes for each Alternative Investment Fund(AIF) it manages, and states that it should be 'reasonable'. The idea behind such a law is not to allow high or critical debt levels in economy to mount in the first place, which is a laudable goal. The European Securities and Markets Authority(ESMA) is designated as the institution to supervise the AIFMs. An implication of the findings of this study is that probably ESMA should not try to burden the AIFMs with too much rules and paper work, since they have enough internal incentives to conduct their activities within limits. That said, the numerous limitations of the thesis can be mentioned again, not least the problem of endogeneity, or the possibility that the AIFMs are prudent because of the legislation in place. Nevertheless the understanding of the author of the thesis is that the private equity firms are financial 'experts' and should be regulated accordingly, though not excessively.

Directions for future research could be several fold. Connecting the funds that finance each deal could yield important insights, as well as accounting for the total amount of debt for each transaction, its structure and so on. Combining the dataset with the US data could be beneficial, or comparing the two geographies could also offer conclusions for the policy-makers.

Part VIII. References

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Part IX. Appendix

- The R code for all the calculation(including construction of the control group, as well as all regressions), could be found at the following link: http://rpubs.com/Tycho/thesis

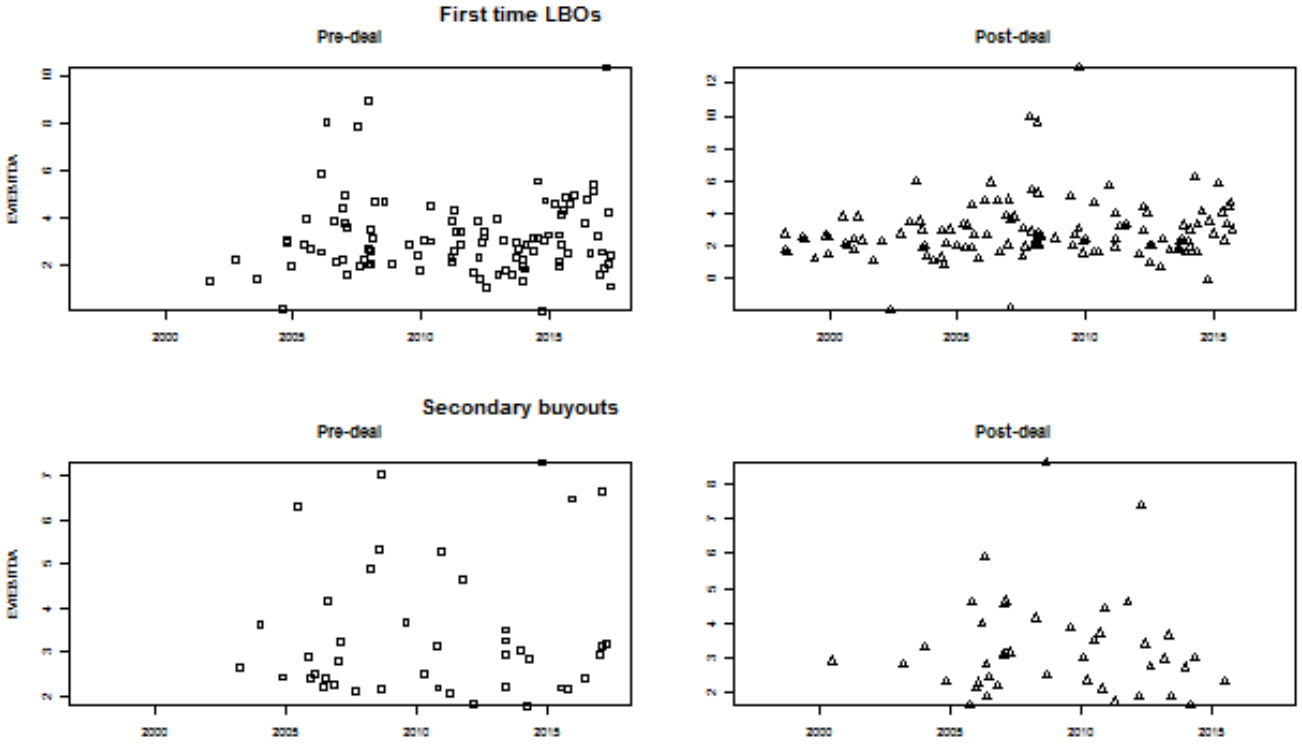

Figure 3: Valuation multiple EV/EBITDA trough time

The valuation multiple EV/EBITDA is plotted in the four sub-plots of the figure. The upper panel reflects the first time PE-backed, the bottom panel for the secondary buyouts. The data points are sparse and are based on information supplied by BvD. There could be some subjective estimation in the computation of the numbers. Pre- and post-deal data are also computed by BvD.

Table XIV: Number of deals grouped by country of origin.

First Time PE-backed				Secondary buyout			
Target		Acquirer		Target		Acquirer	
Country	Deals	Country	Deals	Country	Deals	Country	Deals
GB	1210	GB	1266	GB	507	GB	524
FR	664	FR	537	FR	290	FR	215
DE	561	DE	448	DE	143	US	206
IT	334	US	418	SE	95	DE	98
ES	317	NL	304	NL	86	Unknown	85
SE	304	SE	248	IT	74	NL	65
NL	285	IT	215	ES	63	SE	57
DK	193	ES	214	BE	48	IT	39
FI	162	Unknown	212	FI	47	ES	36
BE	159	DK	156	DK	37	LU	28
PL	137	FI	141	NO	36	FI	26
NO	118	LU	113	CH	28	BE	21
CH	114	BE	112	LU	17	DK	21
CZ	75	PL	104	AT	13	NO	19
RU	73	NO	93	PL	10	CH	14

Table XV: Private equity firms represented in the sample

Private equity firms are sorted by the frequency of their acquisitions found in the two samples. The first 20 entry of the most active PEs are displayed. The companies with more then 5 acquisitions are labelled as 'experienced'.

First time LBOs		Secondary buyouts	
Private equity firm	Deals	Private equity firm	Deals
3I GROUP PLC	40	LBO FRANCE GESTION SAS	19
CARLYLE GROUP LP	19	3I GROUP PLC	15
GIMV NV	19	CVC CAPITAL PARTNERS LTD	12
POLARIS MANAGEMENT A/S	18	BARCLAYS PRIVATE EQUITY LTD	10
ARGOS SODITIC PARTNERS SA	16	BC PARTNERS LTD	10
CVC CAPITAL PARTNERS LTD	16	ADVENT INTERNATIONAL CORPORATION	8
ADVENT INTERNATIONAL CORPORATION	15	BLACKSTONE GROUP LP, THE	8
BIMBO TEAM	15	BRIDGEPOINT ADVISERS LTD	8
CAPMAN OYJ	15	BRIDGEPOINT CAPITAL LTD	8
BENCIS CAPITAL PARTNERS BV	14	NAXICAP PARTNERS SA	8
ARQUES INDUSTRIES AG	13	INFLEXION PRIVATE EQUITY PARTNERS LLP	7
VALUE8 NV	13	TA ASSOCIATES LP	7
WATERLAND PRIVATE EQUITY INVESTMENTS BV	13	ASTORG PARTNERS SAS	6
ACCENT EQUITY PARTNERS AB	12	CHARTERHOUSE CAPITAL PARTNERS LLP	6
AXA INVESTMENT MANAGERS PRIVATE EQUITY EUROPE SA	12	CINVEN LTD	6
HGCAPITAL LLP	12	DUKE STREET CAPITAL LTD	6
MBI TEAM - UNITED KINGDOM	11	EXPONENT PRIVATE EQUITY LLP	6
NORDSTJERNAN AB	11	HGCAPITAL LLP	6
OAKTREE CAPITAL MANAGEMENT LP	11	INTERMEDIATE CAPITAL GROUP PLC	6
PENTA INVESTMENTS LTD	11	INVESTCORP BANK BSC	6